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(56) Documents cited

GB 2230582 A GB 1263230 A EP 0211454 A1
US 4281862 A

(58) Field of search

UK CL (Edition K) F2G
INT CL⁵ F16L
Online databases: WPI

(54) Sealed joints in pipe fittings

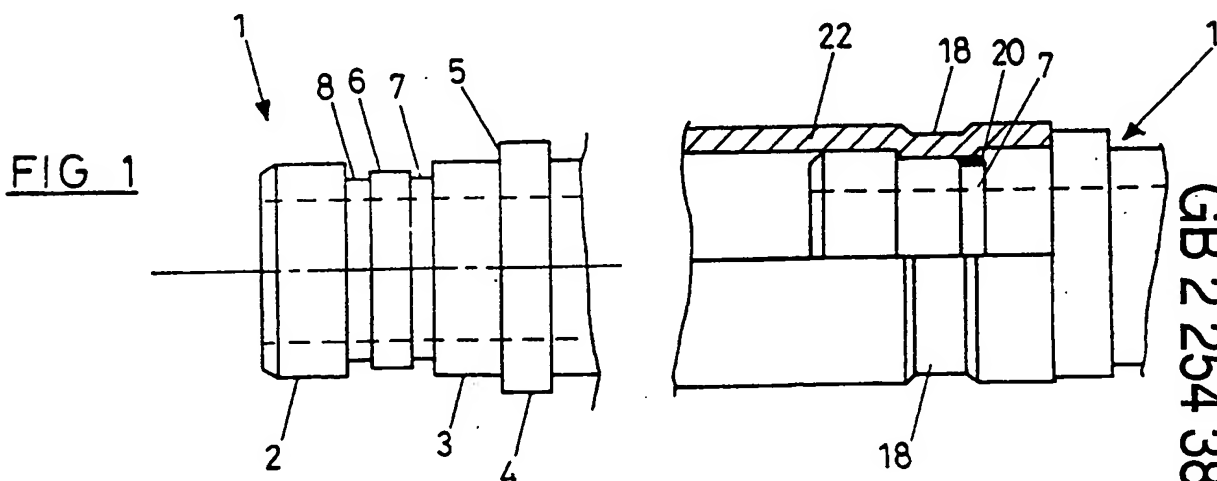
(57) A method and apparatus for forming a joint in an end of a pipe or fitting (22). A connector (1) has a groove (7) or grooves (7, 8) with O-rings (20) in the grooves (7, 8). The portion of the connector including the grooves (7, 8) and O-rings (20) is placed in the end of the pipe (22) and the pipe is crimped about the connector with a crimping tool to establish a mechanical and sealing joint between the connector (1) and the pipe (22).

The pipe may be sufficiently plastic to adhere to the connector 1, upon being crimped, to form a sealing connection thereby removing the need of O-rings.

A hollow cylindrical sleeve of a malleable material (e.g. copper or aluminium) may be crimped about the area of the pipe containing connector 1.

A hand-operated crimping tool comprising pivotable levers is also provided.

FIG 3



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1990.

FIG 1

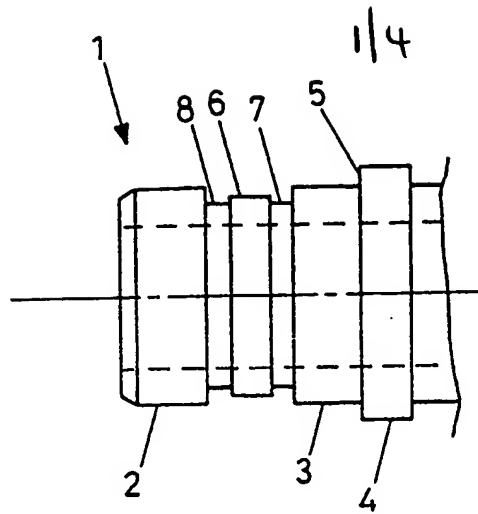


FIG 2

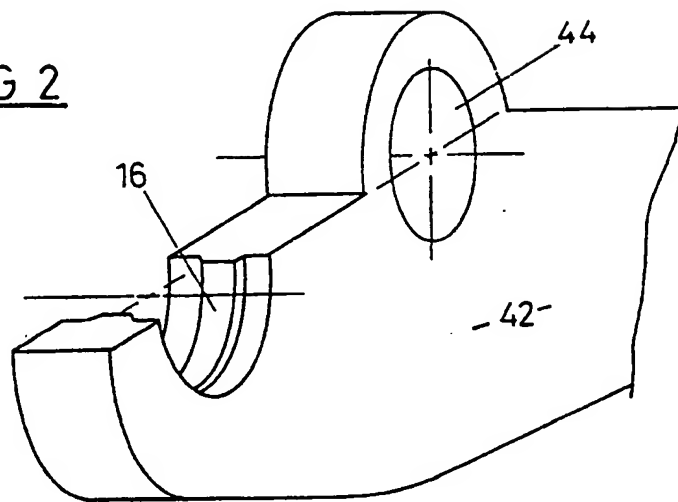
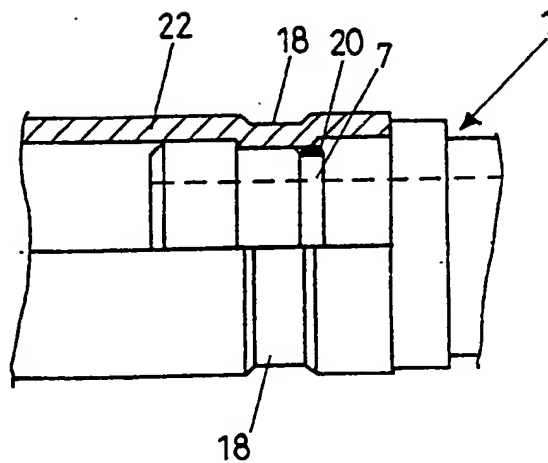
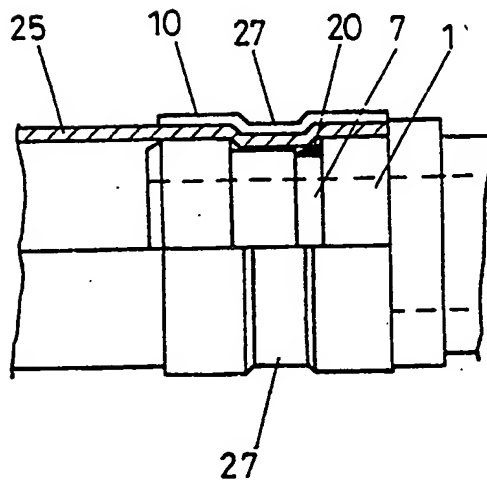
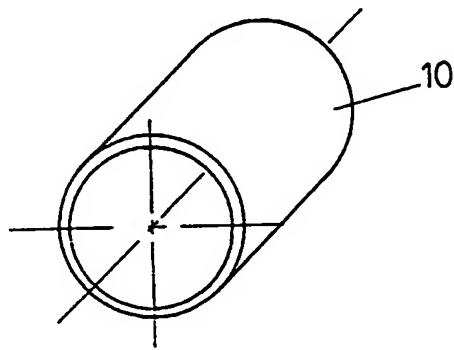
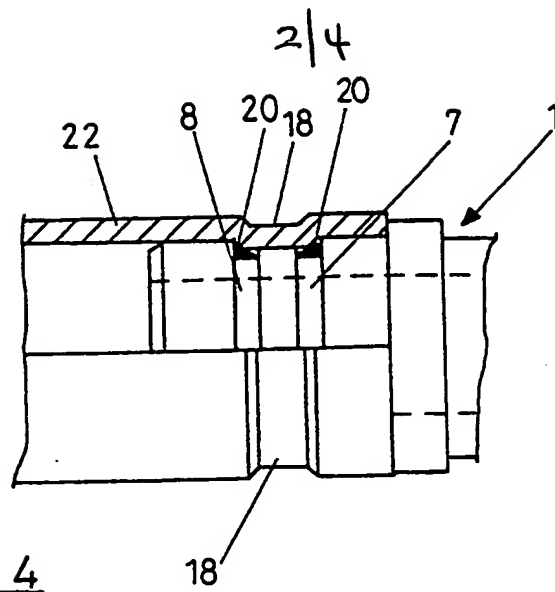


FIG 3





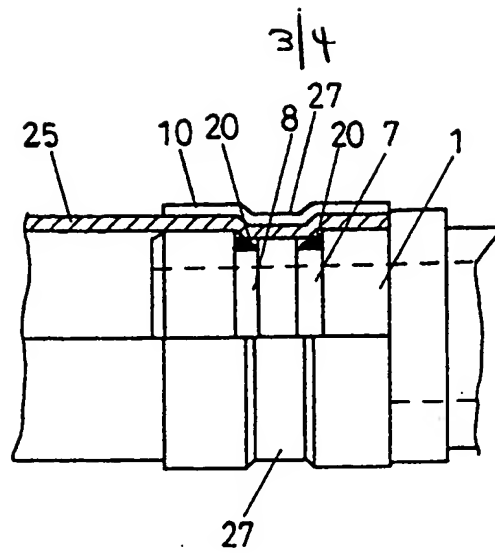


FIG 7

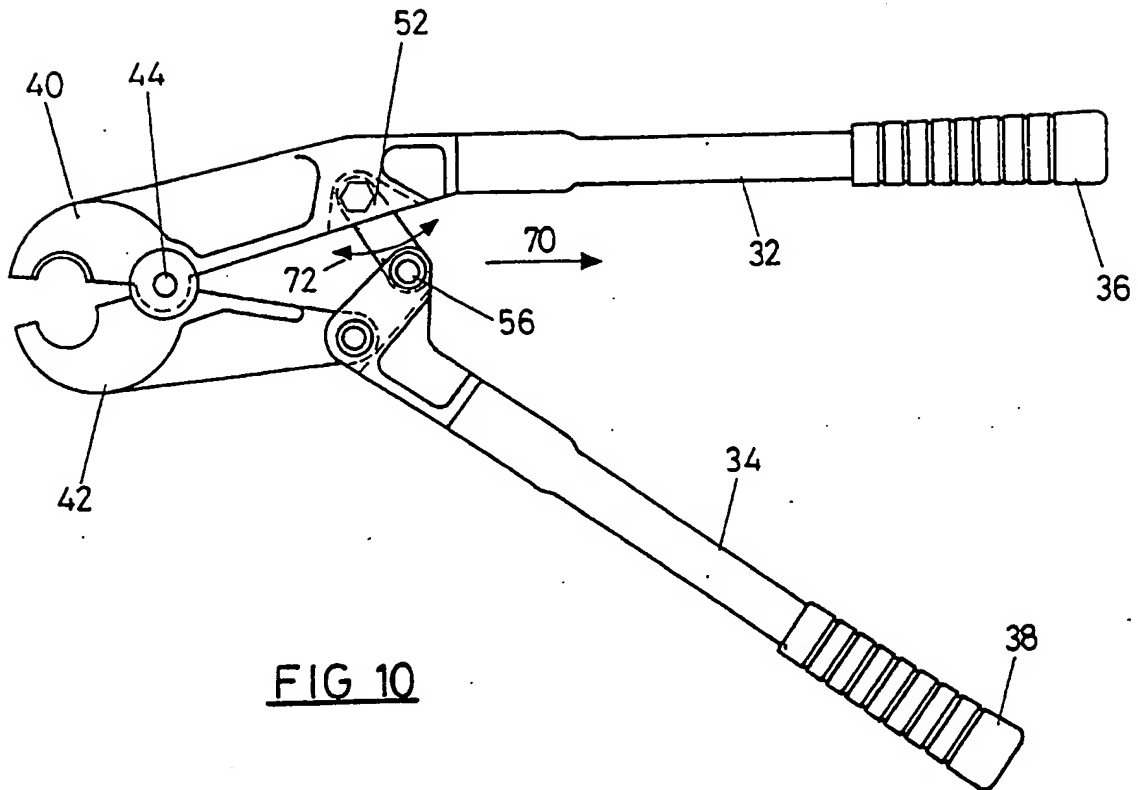


FIG 10

FIG 9

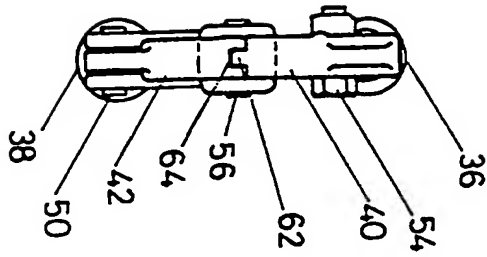


FIG 9

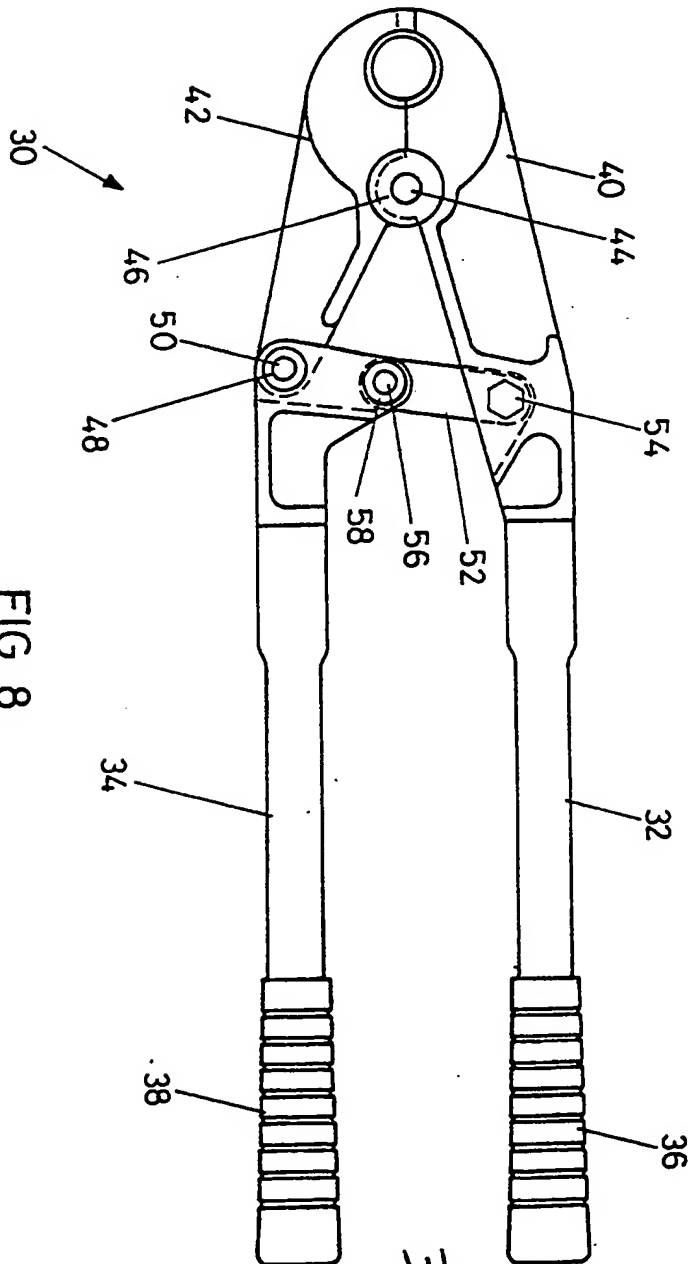


FIG 8

- 1 -

This invention relates to methods of and/or apparatus for forming joints and has been devised particularly though not solely for forming joints in fluid carrying conduits such as water pipes or pipes or fittings carrying fluids for hydraulic machine applications, and between pipes and fittings used for domestic water supply.

It is an object of the invention to provide methods of and/or apparatus for forming joints which will at least provide the public with a useful choice.

Accordingly the invention may be said to consist in a method of forming a joint using a male connector for fitting on a pipe end or fitting end, said connection having at least one substantially annular groove thereon and at least one sealing means to provide a seal between said pipe and said connector, said method comprising the steps of, placing said at least one sealing means in each of said at least one groove, placing an end of said connector and said sealing means in said groove in said end of said pipe, and crimping said pipe about said groove to deform substantially permanently a part of said pipe which encircles said groove beyond its elastic limit to establish a mechanical and sealing joint between said connector and said pipe.

In a further aspect the invention may be said to consist in apparatus for use in forming a joint on an end of a pipe or fitting, said apparatus comprising a connector for connection to said pipe, said connector having at least one substantially annular groove therein; at least one sealing means for each said groove, said end of said pipe being crimped over a part of said connector including said groove and sealing means such that the inner surfaces of said pipe adjacent said groove are configured to be substantially coterminous with an outer surfaces of said pipe and said groove with said sealing means shaped to sealingly engage said pipe and said connector.

In a still further aspect the invention may be said to consist in apparatus for crimping a pipe or fitting on to a connector having a groove therein, said apparatus comprising at least two jaws and manually operable actuating means for closing said jaws, said jaws each having an inner crimping surface including a central protruding portion and said jaws being operably connected such that

upon operation of said manually operable actuating means, said jaws close about an outer surface of said pipe so that said central portion inwardly crimps said pipe about said connector and a part thereof into said groove.

5 In a still further aspect the invention may be said to consist in a crimping tool having a first jaw and a second jaw pivotally connected to said first jaw, said first jaw being operably connected to a first handle and said first jaw or said first handle being pivotally connected to a first end of a link member, and a second handle having a first pivot means and a second pivot means spaced apart from said first pivot means, said first pivot means providing a pivotal connection
10 between said second handle and said second jaw and said second pivot means providing a pivotal connection between said second handle and a second end of said link member, the construction and arrangement being such that a mechanical advantage is provided as between movement of said handles relative to movement of said jaws.

15 To those skilled in the art to which the invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the scope of the invention as defined in the appended claims. The disclosures and the descriptions herein are purely illustrative and are not intended to be in any sense limiting.

20 This invention may also broadly be said to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, and any or all combinations of any two or more of said parts, elements or features, and where specific integers are mentioned herein which have known equivalents in the art to which this invention relates,
25 such known equivalents are deemed to be incorporated herein as if individually set forth.

The invention consists in the foregoing and also envisages constructions of which the following gives examples only.

30 Figure 1 is an elevational view of a part of a connection member according to the present invention;

Figure 2 is a perspective view of a jaw of a crimping tool for use in

accordance with the present invention;

Figures 3 and 4 are elevations in part section of a connection member in use in the end of a pipe or fitting;

5 Figure 5 is a perspective view of a sleeve for use in accordance with the present invention;

Figures 6 and 7 are elevations in part section of a connection member in use in the end of a plastics pipe or fitting;

Figures 8 and 10 are front elevations of a crimping tool in accordance with the present invention;

10 Figure 9 is an end elevation of the crimping tool of Figure 8.

Referring to Figure 1, one end of a male connector of substantially cylindrical form generally referenced 1 has two outer surfaces 2 and 3 which in use contact the inner surface of a pipe or fitting and which are separated by at least one substantially annular groove comprising areas 6 and/or 7 of reduced diameter. Preferably another annular groove 8 is also provided and further 15 annular grooves may also be provided if required. An expanded portion 4 of the connector member has a shoulder 5 which in use abuts against the end of a deformable and preferably metal or plastics e.g. copper or polybutylene pipe or a water supply fitting. The areas 6, 7 and 8 provide space for a pipe to be 20 crimped about the connector and areas 7 and 8 also provide spaces in which at least one sealing means e.g. an O-ring e.g. a nitrile O-ring may be placed to establish a sealing contact between the pipe and the connection member 1. The connector 1 may be constructed of similar metallic material to the pipe or tube e.g. copper or stainless steel or be constructed from a plastics material.

25 Figure 2 shows the profile of the inner surface of a jaw 42 of a crimping tool, the jaw having a pivot hole 44 which enables a crimping surface 16 together with another similar crimping surface on another jaw (not shown in Figure 2) pivotally connected to jaw 46 at hole 44 to be closed about the outer surface of a pipe by a user upon operation of manually actuatable operable means 30 e.g. handles (not shown in Figure 2) connected to the jaws, thus crimping the pipe or fitting.

In Figure 3 a connector member 1 having grooves 6 and 7 is shown crimped into the end of a pipe or fitting 22.

The crimping surface 16 of the crimping tool is sufficiently wide and high to depress pipe 22 firmly into the spaces formed by annular grooves 6 and 7 to crimp the pipe to the connector member. The depression left on the outer surface of pipe 22 by the crimping surface 16 is referenced 18 in Figure 2.

Figure 4 shows the connector member 1 with grooves 6, 7 and 8.

To form a sealed joint in a pipe or fitting in accordance with the present invention, a sealing ring comprising e.g. a nitrile O-ring 20 is placed about area 7 of part of the connector 1 and a further O-ring is placed about area 8 (if this annular groove is provided as shown in Figure 4). One end of the connector is then placed within the end of a pipe 22 as shown in Figure 2. The pipe 22 is preferably constructed of a malleable material e.g. copper, stainless steel or aluminium so that the crimping tool 14 is able to crimp the area of pipe 22 about at least areas 6 and 7 of the connector 1 so that the pipe 22 is securely crimped about the connector by deforming the material of which the pipe is constructed beyond its elastic limit to provide a mechanical connection between the connector and the pipe 22. Thus the material from which the pipe is constructed must be sufficiently malleable to enable the pipe to be crimped about the connector and must also be sufficiently inflexible to maintain contact with the connection member eg. with areas 2, 3, 6, 7 and 8 or with the shoulders between areas 1 and 8, 8 and 6, 6 and 7, and 3 and 7 to ensure the connector is not expelled from the pipe under force exerted e.g. by pressure from a fluid in the pipe. It will be seen that when the pipe is crimped about connector 1 the sealing means comprising O-ring or O-rings 20 are in firm contact with surface 7 of the connector and the inner surface of the crimped pipe 22. Thus a sealing connection is also established.

Referring now to Figure 5, a hollow cylindrical sleeve of a malleable material 10 is shown. The malleable material from which the sleeve is constructed is a metal e.g. preferably copper or aluminium but may be any other

material which is sufficiently malleable to enable a plastics pipe to be crimped about a connector as described below.

Referring to Figure 6, a connector 1 similar to that of Figure 1 but without groove 8 is shown within the end of a plastics pipe 25. The sleeve of Figure 4 is shown about the outer surface of the plastics pipe 25 about the area of the pipe which contains the connector 1. The sleeve 10 has been crimped about its outside surface i.e. the material of which the sleeve is constructed has been deformed beyond its elastic limit using a crimping tool having a crimping surface such as the crimping surface 16 shown in Figure 2, in order to depress the plastics pipe 25 firmly into the spaces formed by annular grooves 6 and 7 of the connection member so that the pipe is crimped to the connector. The depression left on the outer surface of the sleeve 10 by the crimping surface 16 is referenced 27 in Figure 6.

Figure 7 shows the connector 1 of Figure 1 in the end of a plastics pipe 25.

To form a sealed joint in a plastics pipe or fitting in accordance with the present invention the sleeve 10 is placed over the end of pipe 25 (Figures 6 and 7) so that it contacts the outer surface of pipe 25 about the area of the pipe within which the connector is to be placed. Then an end of the connector 1 such as the end shown in Figure 1 is placed within the end of the plastics pipe 25 shown in Figures 6 and 7. It will be seen that a sealing ring comprising e.g. a nitrile O-ring 20 as described with reference to Figure 2 may be placed about each of areas 7 and 8 (or further grooves if provided) of the connector 1 before the connector is inserted into the end pipe 25 to form a sealing connection between the connector and the pipe. However, the sealing ring or rings will not always need to be present since the plastics material from which pipe 25 is constructed may for some pipes be sufficiently plastic to adhere closely to the connector upon being crimped and thus form a sealing connection. Thus the plastics material from which pipe 25 is constructed is preferably sufficiently plastic to enable the pipe to be deformed inwardly about the annular groove comprising areas 6, 7 and 8 of the connector. Alternatively, the sleeve 10 may

be placed over the end of pipe 25 after the end of the connector 1 is inserted within the pipe. The user now uses a crimping tool having a crimping surface such as the crimping surface 16 shown in Figure 2 to crimp the sleeve 10 about the plastics pipe 25 so that the plastics pipe 25 is securely crimped to the connector 1 to provide a mechanical connection between the connector and the pipe 25. Hence the material from which the sleeve 10 is constructed must be sufficiently malleable to enable the sleeve to force the plastics pipe into the groove in the connector and it must also be sufficiently inflexible to ensure that the connector is not expelled from the pipe under force exerted e.g. by pressure from a fluid in pipe 25. When the sleeve has been crimped about the plastics pipe and the connector as described, it will be seen that the pipe 25 is in contact with at least area 6 of the connector, and if sealing ring or rings 20 are present the plastics pipe will be in contact with the sealing rings about its circumference and the sealing ring or rings will be in contact with areas 7 and 8 of the connector. Thus a sealing connection is established between the pipe 25 and the connector. It will also be seen that since part of pipe 25 is held in a deformed position within the groove comprising areas 6, 7 and 8 of the connector by the crimped sleeve 10, a firm mechanical connection is also established between the pipe 25 and the connection member 1.

It will also be seen that the connector may be a solid plug in order to completely seal the end of a pipe, or the connector may be tubular and the contours 2, 3, 6, 7 and 8 may also be present on the other side of the area 4 of the connector, so that the end of another pipe or fitting may be joined to the other end of the connector by the same method described above. Shoulder 5 is not a necessary part of the connector, but is desirable since it simplifies the task of crimping the pipe, sleeve or fitting in the correct position after an end of the connector is in place within the pipe or fitting.

Referring to Figure 8 a crimping tool is shown generally referenced 30. The crimping tool 30 has a first handle 32 and a second handle 34, the handles having hand grips 36 and 38 respectively. First and second jaws 40 and 42 are also provided. The jaws having an inner crimping surface with a central

protruding portion such as surface 16 (Figure 3). The jaw 40 is connected to a first handle 32. The jaws 40 and 42 are pivotally connected to each other by a pivot means comprising aperture 44 in a part of each of the jaws 40 and 42 and a shaft 46 through the aligned apertures 44. A second handle 34 is pivotally
5 connected to jaw 42 by a first pivot means comprising e.g. aligned apertures 48 having a shaft or pin 50 therethrough. A link member 52 is also provided, a first end of the link member 52 being pivotally connected to jaw 40 and/or handle 32 by e.g. a threaded nut and bolt 54 through apertures in both the handle 32 and/or the jaw 40 and corresponding aperture in link member 52. The second
10 end of link member 52 is pivotally connected to handle 34 again by a second pivot means comprising e.g. a pin or shaft 56 through aligned apertures 58 in both the link member and the handle 34. The arrangement of the pivotal connections 50 and 56 provides mechanical lever in a bell crank arrangement. The jaws 40 and 42 also have alignment means comprising a protrusion 62
15 on jaw 40 (Figure 9) and a corresponding depression 64 (Figure 9) on jaw 42 so that the jaws are in correct alignment when they are closed by a user about e.g. a pipe to be crimped.

Referring to Figure 10 the crimping tool is shown in the open position. To open jaws 40 and 42 a user grasps hand grips 36 and 38 and moves these
20 away from each other. Such movement causes the pivotal link 56 between handle 34 and link member 52 to move away from the pivotal link 44 between jaws 40 and 42 in the direction indicated by arrow 70. Similarly, movement of the handles 32 and 34 toward each other causes pivotal link member 56 to move in a direction opposite that indicated by arrow 70. Such movement of the
25 handles causes the link member 52 to rotate through an angular arc of movement generally indicated by arc 72. Thus the arrangement provides a considerable mechanical advantage as between movement of handles 36 and 38 and corresponding movement of jaws 40 and 42, enabling objects such as e.g. pipes and the like to be crimped with minimal effort on the part of the user.

30 As shown in Figure 10 the first handle 32 of the crimping tool is rigidly fixed to jaw 40. Thus to open and close the jaws 40 and 42 of the crimping tool,

a user may keep handle 32 in a substantially stationary position and move handle 34 to move jaw 42 relative to jaw 40 to provide a crimping action. Many crimping tools require movement of both handles for satisfactory operation and movement of both handles is impossible in some locations eg. corners between walls. The present invention provides the advantage of allowing a user to crimp pipes or fittings which are in difficult corners.

From the foregoing it will be seen that the present invention provides both apparatus and a method for making an effective sealed connection between pipes or fittings which may be constructed of metallic or plastic materials and may even be of different sizes. The present invention also provides a method of sealing the end of a pipe and a crimping tool for use with crimping pipes in order to form sealing connections.

CLAIMS

1. A method of forming a joint using a male connector for fitting on a pipe or fitting end, said connection having at least one substantially annular groove thereon and at least one sealing means to provide a seal between said pipe and said connector, said method comprising the steps of, placing said at least one sealing means in each of said at least one groove, placing an end of said connector and said sealing means in said groove in said end of said pipe, and crimping said pipe about said groove to deform substantially permanently a part of said pipe which encircles said groove beyond its elastic limit to establish a mechanical and sealing joint between said connector and said pipe.

2. A method as claimed in claim 1 which includes the steps of placing a sleeve about an outer surface of said pipe end before the step of placing said end of said connection member and said sealing means in said groove in said end of said pipe and crimping said sleeve about said groove to deform substantially permanently a part of said sleeve which encircles said groove beyond its elastic limit to establish a mechanical and sealing joint between said connector and said pipe

3. A method as claimed in Claim 1 wherein said step of crimping said pipe includes the step of using a crimping means, the jaws of said crimping means have an annular rib to compress material into said groove.

4. A method as claimed in claim 2 wherein said step of comprising said sleeve includes the step of using a crimping means, the jaws of said crimping means having an annular rib to compress material into said groove.

5. A method as claimed in any one of claims 1 to 4 which includes the step of connecting an end of another pipe to a free end of said connection member, said free end having another said at least one annular groove therein and another said at least one sealing means being provided in said other groove, and

repeating the preceding steps to establish a mechanical connection between said free end and said other pipe and to establish a sealing contact between said other pipe, said free end and said other means.

6. A method as claimed in claim 5 including the steps of connecting said end of said other pipe to said free end of said connection member using another sleeve, and repeating the preceding steps to establish a mechanical and sealing joint between said connector and said pipe.

7. A method of forming a joint substantially as herein described with reference to, and as illustrated by, the accompanying drawings.

8. Apparatus for use in forming a joint on an end of a pipe or fitting, said apparatus comprising a connector for connection to said pipe, said connector having at least one substantially annular groove therein; at least one sealing means for each said groove, said end of said pipe being crimped over a part of said connector including said groove and sealing means such that the inner surfaces of said pipe adjacent said groove are configured to be substantially coterminous with an outer surfaces of said pipe and said groove with said sealing means shaped to sealingly engage said pipe and said connector.

9. Apparatus as claimed in claim 8 including said at least one sealing means.

10. Apparatus as claimed in claim 8 or claim 9 further comprising crimping means for establishing a mechanical contact and sealing contact between said pipe and said connection member, the jaws of said crimping means having a substantially annular rib to compress material into said groove.

11. Apparatus as claimed in any one of claims 8 to 10 wherein said at least one sealing means comprise at least one O-ring.

12. Apparatus as claimed in claim 11 wherein said at least one O-ring comprises a nitrile O-ring or O-rings.
13. Apparatus as claimed in any one of claims 10 to 12 wherein said crimping means comprise a crimping tool.
14. Apparatus as claimed in any one of claims 4 to 9 wherein said pipe or fitting is constructed of a malleable material.
15. Apparatus for forming a joint substantially as herein described with reference to, and as illustrated by, the accompanying drawings.
16. Apparatus for crimping a pipe or fitting on to a connection member having a groove therein, said apparatus comprising at least two jaws and manually operable actuating means for closing said jaws, said jaws each having an inner crimping surface including a central protruding portion and said jaws being operably connected such that upon operation of said manually operable actuating means, said jaws close about an outer surface of said pipe so that said central portion inwardly crimps said pipe about said connection member and a part thereof into said groove.
17. Apparatus as claimed in claim 16 having a first jaw and a second jaw pivotally connected to said first jaw, said first jaw being operably connected to a first handle and said first jaw or said first handle being pivotally connected to a first end of a link member, and a second handle having a first pivot means and a second pivot means spaced apart from said first pivot means, said first pivot means providing a pivotal connection between said second handle and second pivot means providing a pivotal connection between said second handle and a second end of said link member, the construction and arrangement being such that a mechanical advantage is provided as between movement of said handles relative to movement of said jaws.

18. Apparatus as claimed in claim 17 wherein movement of said handles toward each other moves said jaws toward each other.
19. Apparatus as claimed in claim 17 or claim 18 wherein said first handle is rigidly connected to said first jaw so that movement of said second handle while said first handle is kept in a substantially stationary position moves said second jaw relative to said first jaw.
20. Apparatus as claimed in any one of claims 17 to 19 wherein movement of said handles moves said link member angularly about the pivotal connection between said first handle and said link member.
21. Apparatus as claimed in any one of claims 17 to 20 wherein movement of said handles away from each other moves the pivotal connection between said second handle and said link member away from the pivotal connection between said jaws and movement of said handles toward each other moves the pivotal connection between said second handle and said link member toward the pivotal connection between said jaws.
22. Apparatus as claimed in any one of claims 17 to 21 wherein said first pivot means and said second pivot means are provided on said second handle in the form of a bell crank.
23. Apparatus as claimed in any one of claims 17 to 22 wherein said jaws are provided with closure alignment means comprising a projection in an end surface of one jaw and a corresponding depression in an end surface of the other jaw such that upon closure of said jaws said projection enters said depression.
24. Apparatus for crimping onto a connector member substantially as herein described with reference to, and as illustrated by the accompanying drawings.

25. A crimping tool having a first jaw and a second jaw pivotally connected to said first jaw, said first jaw being operably connected to a first handle and said first jaw or said first handle being pivotally connected to a first end of a link member, and a second handle having a first pivot means and a second pivot means spaced apart from said first pivot means, said first pivot means providing a pivotal connection between said second handle and said second jaw and said second pivot means providing a pivotal connection between said second handle and a second end of said link member, the construction and arrangement being such that a mechanical advantage is provided as between movement of said handles relative to movement of said jaws.

26. A crimping tool as claimed in claim 25 wherein movement of said handles toward each other moves said jaws toward each other.

27. A crimping tool as claimed in claim 25 and claim 26 wherein said first handle is rigidly connected to said first jaw so that movement of said second handle while said first handle is kept in a substantially stationary position moves said second jaw relative to said first jaw.

28. A crimping tool as claimed in any one of claims 25 to 27 wherein movement of said handles moves said link member angularly about the pivotal connection between said first handle and said link member.

29. A crimping tool as claimed in any one of claims 25 to 28 wherein movement of said handles away from each other moves the pivotal connection between said second handle and said link member away from the pivotal connection between said jaws and movement of said handles toward each other moves the pivotal connection between said second handle and said link member toward the pivotal connection between said jaws.

30. A crimping too as claimed in any one of claims 25 to 29 wherein said first

pivot means and said second pivot means are provided on said second handle in the form of bell crank.

31. A crimping tool as claimed in any one of claims 25 to 30 said jaws are provided with closure alignment means comprising a projection in a surface of one jaw and a corresponding depression in a surface of the other jaw such that upon closure of said jaws said projection enters said depression.

32. A crimping tool as claimed in anyone of claims 25 to 31 wherein each jaw has a crimping surface, said crimping surface having a central protruding portion.

33. A crimping tool substantially as herein described with reference to, and as illustrated by, the accompanying drawings.

34. Any novel feature or combination of features described herein.

Patents Act 1977

Examiner's report to the Comptroller under
Section 17 (The Search Report)

-15-

Application number

9206187.8

Relevant Technical fields

Search Examiner

M SIDDIQUE

i) UK CI (Edition K) F2G

(ii) Int CL (Edition 5) F16L

Databases (see over)

Date of Search

18 JUNE 1992

(i) UK Patent Office

(ii) ONLINE DATABASES: WPI

Documents considered relevant following a search in respect of claims

1-15

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB A 2230582 (TIFT) Particularly figure 2; grooved male member 1, sealing ring 9, end fitting 2)	1, 8 at least
A	GB 1263230 (LUNKEN) Male member 15 with groove/recess 18; pipe 20 deformed into recess 18	2
X	EP A1 0211454 (VOLVO) Figures 7, 8	1, 8 at least
X	US 4281862 (RIDENOUR) Figures 7, 11; column 4 lines 29-48; column 9 line 65 - column 10	1, 8 at least

SF2(p)

up - c:\wp51\doc99\fil000554

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

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